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**GROUNDWATER SAMPLING RESULTS
LIVINGSTON RAIL YARD
LIVINGSTON, MONTANA**

September 1989

Submitted to:

**Montana Department of Health
and Environmental Sciences
Cogswell Building
Helena, Montana 59807**

Submitted by:

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1.0 INTRODUCTION

Envirocon, Inc., representing Burlington Northern Railroad, took fourteen water samples from wells on and around the Livingston rail yard for the September 1989 monthly sampling round. Samples were taken and shipped to Energy Laboratories, Inc. (ELI) on September 23. As shown on Table 1.0, the samples included eleven monitoring wells, one municipal supply well, one trip blank, and one field duplicate. The locations of these wells are shown on Figure 1.0. Sampling and analytical methods were in accordance with the Interim Remedial Measures Work Plan (IRMWP).

All interpretations presented in this report are necessarily based on information available at the time of publication. Interpretations may change when further data is available.

2.0 RESULTS AND INTERPRETATION

The chlorinated ethenes tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene (DCE) continue to be the compounds of interest detected in the alluvial aquifer beneath the rail yard. Other contaminants detected include chlorobenzene and 2-chlorotoluene. A summary of analytical results is compiled in Table 2.0. Complete laboratory analytical results are compiled in Appendix A.

Results from sample 140101-123 (well L-87-5) show that chlorinated ethene concentrations adjacent to the shop complex are similar to previous monthly results. See Table 2.0. This indicates that the contaminant source mechanism is relatively static and that seasonal water level fluctuations have little influence on the dispersal of these contaminants near the shop complex. Installation of additional monitoring wells listed in the IRMWP will further delineate source mechanisms and the extent of contamination beneath the shop complex.

Chlorobenzene, 2-chlorotoluene, and DCE concentrations continued to increase east of the diesel plume at wells L-88-10 and L-88-13 (samples 140101-126 and 140101-124 respectively). This increase may result from chlorinated compounds released from the diesel plume as the water table rose during the summer. Further sampling, particularly at well L-87-2, will be necessary to fully



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TABLE 1.0

**CORRELATION OF WELL AND SAMLE NUMBERS
Sep-89**

SAMPLE NUMBER	WELL NUMBER	ANALYTICAL METHOD*	SAMPLE METHOD**	SAMPLE DATE
140101-111	B-ST	524.2	TAP	9/20/89
140101-117	LS-11	601	DED	9/23/89
140101-118	LS-8	601	DED	9/23/89
140101-119	#7	601	DED	9/23/89
140101-120	#8	601	DED	9/23/89
140101-121	L-87-3	601	DED	9/23/89
140101-122	L-87-8	601	DED	9/23/89
140101-123	L-87-5	601	DED	9/23/89
140101-124	L-88-13	601	DED	9/23/89
140101-125	#6	601	DED	9/23/89
140101-126	L-88-10	601	DED	9/23/88
140101-127	L-87-7	524.2	DED	9/23/89
140101-128	TRIP BLANK	601	N/A	9/23/89
140101-129	#6 DUPLICATE	601	DED	9/23/89

NOTES:

* Refers to EPA analytical method

** DED - dedicated sample pump

N/A - Not applicable

TABLE 2.0

COMPARISON OF MONTHLY ANALYTICAL RESULTS
1989

WELL NO.	PCE (ug/l)				TCE (ug/l)				DCE* (ug/l)				2-CHLOROTOLUENE				CHLOROBENZENE			
	MAY	JUNE	JULY	AUG	SEP	MAY	JUNE	JULY	AUG	SEP	MAY	JUNE	JULY	AUG	SEP	MAY	JUNE	JULY	AUG	SEP
1			0.66	0.62				<0.5	<0.5		<1.0	<1.0	<1.0					<1.0		
2			0.7	1.3				<0.5	<0.5		<1.0	<1.0	<1.0					<1.0	<1.0	
3	0.69			0.74				<0.5	<0.5		<1.0	<1.0	<1.0					<1.0	<1.0	
4			<0.5	<0.5				<0.5	<0.5		<1.0	<1.0	<1.0					<1.0	<1.0	
5	<0.5		<0.5	<0.5				<0.5	<0.5		<1.0	<1.0	<1.0					<1.0	<1.0	
6	7.1	11	7.2	4.9	3.9		0.5	<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7	33	7.9	0.77	0.5	<0.5	1.2	<0.5	<0.5	<0.5	<0.5	2.9	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8	180	188	151	126	112	9.9	10	8.5	10	5.5	17	24	35	27	19	<1.0	<1.0	<1.0	<1.0	<1.0
11			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5		<1.0		<1.0	<1.0		<1.0	<1.0	<1.0	<1.0	
L-87-1	<0.5		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5		<1.0		<1.0	<1.0		<1.0	<1.0	<1.0	<1.0	
L-87-2																				
L-87-3	262	183	188	195	206	24	22	18	17	15	68	121	81	56	46	<1.0	<1.0	<1.0	<1.0	<1.0
L-87-4	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5		<1.0	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0	<1.0
L-87-5	335	350	349	367	361	8.7	11	15	15	12	5.4	6.2	7.5	7.8	7	<1.0	<1.0	<1.0	<1.0	<1.0
L-87-6																				
L-87-7			<0.5	<0.5	0.87	<0.5	4.3	<0.5	<0.5	<0.5	3.5	2.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
L-87-8	58	32	68	98	104	7.8	4.3	7.3	11	13			6.1	9.3	5.1	<1.0	<1.0	<1.0	<1.0	1
L-88-9	<1.0		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5		<1.0	<1.0	197.1	<1.0	5.7	<1.0	<1.0	<1.0	<1.0	36
L-88-10	160		137	155	147	31		28	30	30	106.3			357	410	<1.0	<1.0	10	28	
L-88-11	<0.5		<0.5	<0.5		<0.5	<0.5	<0.5	<0.5		<1.0	<1.0		<1.0		<1.0	<1.0	<1.0	<1.0	
L-88-12	255		197	197		4.9			4.5		3.5			2.1		<1.0	<1.0	<1.0	<1.0	
L-88-13	52	62	69	80	80	7.6	8.1	11	14	14	6.8	8.1	17	24	27	<1.0	<1.0	2.2	3.6	3.2
LS-6	<0.5		<0.5	<0.5		<0.5			<0.5		<1.0			<1.0		<1.0	<1.0	<1.0	<1.0	
LS-7	<0.5		<0.5	<0.5		<0.5			<0.5		<1.0			<1.0		<1.0	<1.0	<1.0	<1.0	
LS-8	146	181	136	98	86	20	16	14	7.8	6.1	84.3	69	45	21	17	<1.0	<1.0	<1.0	<1.0	<1.0
LS-10																				
LS-11	115	164		23	17	17	15		30	24	58	60		122	140	<1.0	<1.0		167	275
RAINBOW	35					5.2					8.9					<1.0	<1.0		<1.0	
POTW	73			46		6.9			2.1	<0.5	9.2			5.5	<1.0	<1.0	<1.0		<1.0	<1.0
B-STR.				**	<0.5				**	<0.5				**	<1.0	<1.0	<1.0			<1.0
D-STR.				<0.5		<0.5			<0.5		<1.0			<1.0		<1.0	<1.0			
L-STR.	<0.5			<0.5		<0.5			<0.5		<1.0			<1.0		<1.0	<1.0			
Q-STR.	0.66			0.95		<0.5			<0.5		<1.0			<1.0		<1.0	<1.0		<1.0	
CLARENCE WERNER				<0.5		<0.5			<0.5		<1.0			<1.0		<1.0	<1.0		<1.0	

Notes:

* Includes both cis-1,2 and trans-1,2 DCE

** Not sampled due to construction near well

understand the cause of this increase. Diesel samples are presently being analyzed to determine the distribution of chlorinated compounds in the diesel plume. Sample results from the diesel plume will be reported in the October monthly sampling report.

The largest change in contaminant concentrations occurred at well LS-11 (140101-117) where chlorobenzene increased from 167 ug/l in August 1989 to 275 ug/l in September 1989. LS-11 has also shown an increase in DCE concentrations through the summer of 1989, as shown in Table 2.0. Nearby well LS-8 has not shown a similar increase in DCE or chlorobenzene concentrations. Indeed, as shown in Table 2.0, DCE and chlorobenzene concentrations at well LS-8 have decreased during this same period. Additional studies will be conducted to determine the cause of this observation.

The PCE concentration at well 7 (140101-119) dropped below the detection limit for the first time since Envirocon began sampling in May 1989. This continued the monthly trend of decreasing concentrations at well 7. The decrease results from changes in the direction of groundwater flow toward this well. While the water table is high during the summer, flow is easterly from uncontaminated areas, as shown on Figure 1.0. This flow pattern changes to more northerly flow during the winter when the water table is lower.

The sample taken from the B Street municipal water well (140101-111) did not contain any detectable concentrations of any of the volatile organic compounds (VOC's) tested by EPA method 524.2.

3.0 QA/QC RESULTS

Envirocon followed the QA/QC program outlined in Section 10 of the Interim Remedial Measures Work Plan (IRMWP) during the September 1989 monthly sampling round. This program includes:

Field QA/QC

- field duplicates
- trip blanks
- equipment blanks

Laboratory QA/QC

- spiked analyses
- laboratory duplicates
- EPA QA/QC samples

QA/QC samples were shipped "blind" to the laboratory and analyzed by the same analytical method (EPA method 601) as the field samples.

3.1 Field QA/QC

One field duplicate and one trip blank were used to validate field procedures. No equipment blanks were necessary because all water samples were taken from wells equipped with dedicated samplers.

3.1.1 Field Duplicate

A field duplicate from well 6 (140101-129) was sent blind to ELI. As shown in Appendix A, analysis of the duplicate shows close correlation with the original sample from this well. This indicates that laboratory procedures are sufficient to generate reproducible results.

3.1.2 Trip Blank

As shown in Appendix A, no analytes were detected in the trip blank (140101-128). This indicates that sample handling and shipping protocols were sufficient to maintain sample integrity.

3.2 Laboratory QA/QC

Energy Laboratories conducted a spiked analysis, laboratory duplicate analysis, and an EPA QA/QC sample to validate laboratory procedures. ELI's QA/QC plan is on file at the MDHES.

3.2.1 Spiked Analysis

A spiked analysis was conducted on sample 140101-118 (well LS-8). Results of this analysis are shown in Appendix A. The percent recoveries of the test values are all within the acceptable ranges. These results indicate that ELI's laboratory equipment and procedures were adequate to provide accurate results.

3.2.2 Laboratory Duplicate Analysis

ELI performed a duplicate analysis on sample 140101-119 (well 7). Results are shown in Appendix A. As in the original analysis, the duplicate analysis did not detect any VOC's in this sample. This indicates that laboratory equipment and procedures were adequate to provide reproducible analytical results.

3.2.3 EPA QA/QC Sample Analysis

ELI analyzed an EPA QA/QC reference sample in addition to samples submitted by Envirocon. All test values were within acceptable ranges for percent recoveries. These results indicate that laboratory equipment and procedures were adequate to provide accurate results.

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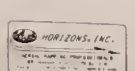
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EXPLANATION

- MONITORING WELL
- MUNICIPAL WATER SUPPLY WELL
- PRIVATE WELL
- POTENTIOMETRIC CONTOUR SHOWING WATER TABLE ELEVATION IN FEET ABOVE MSL



LEGEND	
[Symbol]	1000' Contour
[Symbol]	500' Contour
[Symbol]	200' Contour
[Symbol]	100' Contour
[Symbol]	50' Contour
[Symbol]	25' Contour
[Symbol]	10' Contour
[Symbol]	5' Contour
[Symbol]	2' Contour
[Symbol]	1' Contour
[Symbol]	0' Contour
[Symbol]	Below Sea Level
[Symbol]	Water Table
[Symbol]	Monitoring Well
[Symbol]	Municipal Water Supply Well
[Symbol]	Private Well
[Symbol]	Building
[Symbol]	Open Area
[Symbol]	Forest
[Symbol]	Water
[Symbol]	Highway
[Symbol]	Railroad
[Symbol]	Power Line
[Symbol]	Telephone Line
[Symbol]	Gas Line
[Symbol]	Water Main
[Symbol]	Sanitary Sewer
[Symbol]	Storm Sewer
[Symbol]	Drainage Ditch
[Symbol]	Stream
[Symbol]	Channel
[Symbol]	Swamp
[Symbol]	Marsh
[Symbol]	Shrubland
[Symbol]	Grassland
[Symbol]	Barren Land
[Symbol]	Water Table
[Symbol]	Monitoring Well
[Symbol]	Municipal Water Supply Well
[Symbol]	Private Well
[Symbol]	Building
[Symbol]	Open Area
[Symbol]	Forest
[Symbol]	Water
[Symbol]	Highway
[Symbol]	Railroad
[Symbol]	Power Line
[Symbol]	Telephone Line
[Symbol]	Gas Line
[Symbol]	Water Main
[Symbol]	Sanitary Sewer
[Symbol]	Storm Sewer
[Symbol]	Drainage Ditch
[Symbol]	Stream
[Symbol]	Channel
[Symbol]	Swamp
[Symbol]	Marsh
[Symbol]	Shrubland
[Symbol]	Grassland
[Symbol]	Barren Land



LIVINGSTON RAIL YARD
 ENVIROCON, INC.
 Missoula, Montana
 Date of Map: September 8, 1989

PROJECT NO. 140101	ENVIROCON FIGURE 1.0 POTENTIOMETRIC SURFACE ELEVATIONS IN FEET ABOVE MSL LIVINGSTON, MONTANA SEPTEMBER 1989
DATE 9/89	
REVISION	

